

METHYLATED AND ETHYLATED SEED OIL ADJUVANTS. Richard K. Zollinger, Professor, Department of Plant Sciences, North Dakota State University, Fargo, ND 58108.

Crop oil concentrates (COC) are emulsifiable petroleum oil-based products containing 10% to 15% surfactant and a minimum of 80% w/w phytobland (crop safe) oil. Vegetable oil concentrates (VOC) are emulsifiable vegetable oil products containing 5% to 20 w/w surfactant and a minimum of 80% w/w vegetable oil. These may not be acceptable as substitutes for COC in some applications. Modified vegetable seed oil concentrates are emulsifiable vegetable oil products containing 5% to 20% w/w surfactant, and the remainder chemically modified vegetable oil. These are typically represented by methylated seed oil (MSO); however, chemically the term fatty acid methyl esters (FAME) are more accurate. The emulsifier, the oil class (petroleum, vegetable, etc.), and the specific type of oil in a class all influence effectiveness of an oil adjuvant.

MSO adjuvants were derived from the bio-diesel industry. Triglycerides in seed oil must be esterified to remove glycerol. FAME from sunflower was more solubility in green foxtail wax than VOC or COC. Methyl esters of linseed, cottonseed, and sunflower was similar or more active than ethyl esters, butyl esters, or triglycerides. Methyl esters of palmitic, steric, oleic, linoleic, and linolenic fatty acids were similar in absorption. Generally, the vegetable oil source (canola, linseed, safflower, soybean, sunflower, flax) has minimal influence on efficacy. Usually, FAME is similar in activity to ethyl esters of fatty acids. Herbicide efficacy from major adjuvant classes is generally: MSO>COC>NIS.

MSO adjuvants enhance most herbicides but generally are equal to or better than petroleum oils, except for glyphosate, glufosinate, and lactofen. MSO type adjuvants increase efficacy of most oil soluble (lipophilic) herbicides including ALS enzyme inhibitor herbicides, growth regulator herbicides, photosynthetic inhibiting herbicides, including atrazine, bentazon, and bromoxynil, PPO inhibiting herbicides, and HPPD inhibiting herbicides. ACCase inhibiting herbicides show more variability in response to MSO adjuvants than other chemistry. Sethoxydim phytotoxicity was greater with MSO, while PO and MSO were similar applied with diclofop, fluazifop, and haloxyfop, and MSO was much less effective than PO with quizalofop. Results vary when comparing specific adjuvants but most MSO formulations that fit the ASTM definition of an MSO adjuvant give similar control.

MSO adjuvants can increase droplet spreading, cell permeability, absorption, and efficacy. MSO adjuvants have a greater degree of solvency than other oil adjuvants and can completely dissolve leaf wax of plant species. Oil adjuvants that dissolve plant surface wax and are good solvents for a herbicide should enhance herbicide adsorption. MSO adjuvants provide advantages over COC in postemergence herbicide applications under low moisture conditions where weeds have become "hardened" and develop a thicker cuticle.